

## CLAIMS

We Claim:

1. A computer-implemented method of detecting features on a semiconductor wafer comprising:

collecting data with a plurality of detectors that are positioned about the semiconductor wafer, wherein each detector collects one data frame for each of a plurality of device areas;

transmitting the data frames from each detector to a data distribution node, which is part of a set of data distribution nodes;

transferring a first data frame along a first data transfer path that connects a first and a second data distribution node;

transferring a second data frame along a second data transfer path that connects the first and second data distribution nodes;

routing the data frames from the data distribution nodes to processing nodes, wherein the transferring of data frames between data distribution nodes allows data from any one of the detectors to be routed to any one of the processing nodes; and

processing the data frames within each of the processing nodes.

2. A computer-implemented method as recited in claim 1 wherein the number of data transfer paths equals the number of detectors that is used to collect data.

3. A computer-implemented method as recited in claim 1 further comprising:  
buffering data frames within data distributor buffers within each data distribution node.

4. A computer-implemented method as recited in claim 1 wherein each detector collects data for each of three or more device areas.

5. A computer-implemented method as recited in claim 1 wherein the processing of data further comprises a composite-row based analysis that involves,

generating a first composite image that is made up of each of the data frames collected by one of the detectors, wherein each first composite image is a composite of the images corresponding to each of the device areas;

generating a first composite image corresponding to the data frames collected by each of the detectors; and

comparing each of the first composite images in order to obtain defect information.

6. A computer-implemented method as recited in claim 5 wherein the processing of data further comprises a composite-column based analysis that involves,

for each die, generating a second composite image by combining the data frames collected by each detector corresponding to a specific die; and

comparing each of the second composite images in order to obtain defect information.

7. A computer-implemented method as recited in claim 6 wherein the processing of data further comprises a row based analysis involving,

for each detector, comparing the data frames collected for each of the plurality of device areas, wherein there are four or more device areas.

8. A computer-implemented method as recited in claim 7 wherein the processing of data further comprises a column based analysis involving,

for each die, comparing the data frames collected by each detector.

9. A computer-implemented method as recited in claim 1 wherein the processing of data further comprises a composite-column based analysis that involves,

for each die, generating a second composite image by combining the data frames collected by each detector corresponding to a specific die; and

comparing each of the second composite images in order to obtain defect information.

10. A computer-implemented method as recited in claim 9 wherein the processing of data further comprises a composite-row based analysis that involves,

generating a first composite image that is made up of each of the data frames collected by one of the detectors, wherein each first composite image is a composite of the images corresponding to each of the device areas;

generating a first composite image corresponding to the data frames collected by each of the detectors; and

comparing each of the first composite images in order to obtain defect information.

11. A computer-implemented method as recited in claim 10 wherein the processing of data further comprises a row based analysis involving,

for each detector, comparing the data frames collected for each of the plurality of device areas, wherein there are four or more device areas.

12. A computer-implemented method as recited in claim 11 wherein the processing of data further comprises a column based analysis involving,

for each die, comparing the data frames collected by each detector.

13. A semiconductor wafer inspection system comprising:

a semiconductor wafer having a plurality of device areas;

a plurality of detectors positioned about a semiconductor wafer wherein each detector is configured to collect a data frame for each of the plurality of device areas;

a data distribution system that includes a plurality of data distribution nodes, at least one of the data distribution nodes configured to receive data frames from the detectors;

a plurality of data transfer paths connecting each of the data distribution nodes wherein each data transfer path transfers data frames collected by a respective detector; and

a plurality of processing nodes configured to receive data frames from the data distribution system, the processing nodes configured to analyze the data frames, wherein the data transfer paths allow data frames collected by any one of the detectors to be routed to any one of the processing nodes.

14. A semiconductor wafer inspection system as recited in claim 13 wherein each data distribution node includes a data buffer for data frames collected by each of the detectors.

15. A semiconductor wafer inspection system as recited in claim 13 wherein each detector is configured to collect data from three or more device areas.

16. A semiconductor wafer inspection system as recited in claim 13 wherein each of the processing nodes are configured to perform a composite-row based analysis that involves,

generating a first composite image that is made up of each of the data frames collected by one of the detectors, wherein each first composite image is a composite of the images corresponding to each of the device areas;

generating a first composite image corresponding to the data frames collected by each of the detectors; and

comparing each of the first composite images in order to obtain defect information.

17. A semiconductor wafer inspection system as recited in claim 16 wherein each of the processing nodes are further configured to perform a composite-column based analysis that involves,

for each die, generating a second composite image by combining the data frames collected by each detector corresponding to a specific die; and

comparing each of the second composite images in order to obtain defect information.

18. A semiconductor wafer inspection system as recited in claim 17 wherein each of the processing node are further configured to perform a row based analysis involving,

for each detector, comparing the data frames collected for each of the plurality of device areas, wherein there are four or more device areas.

19. A semiconductor wafer inspection system as recited in claim 18 wherein each of the processing nodes are further configured to perform a column based analysis involving,

for each die, comparing the data frames collected by each detector.